the intestine or omentum may be confused with that of the latter condition. Abscess of the appendix vermiformis is also to be borne in mind.

(8) The strangulated inguinal testicle must be removed. The scrotal testicle may be left if the circulation is not too greatly disturbed.

(9) Because of the fact that this disease is not common, and is, moreover, rather difficult of diagnosis, when cases of this sort are met they should be studied with especial care, with the view of throwing more light upon this subject.

Lauenstein made a correct diagnosis in the case which he has reported, yet he states further on that there seemed to be no urgent indication for operation, so he treated the patient with opium and ice, and did not operate till the end of five days. There seems to be some inconsistency here, for he was certainly aware of the harm which procrastination was doing.

To the above table of cases should be added the Davies-Colley [1] case.

In the ANNALS OF SURGERY, May, 1894, is a paper by Johnson, in which the meagreness of the literature upon this subject is commented upon, and in which is appended an abstract of the history of an additional case.

JAMES P. WARBASSE.

## FISCHER ON SUPPURATIVE INFLAMMATIONS IN THE SUBUMBILICAL SPACE.[2]

THE author begins by calling attention to the fact that the periumbilical region, so interesting from a surgical stand-point, may be subdivided into the supraumbilical region, following the course of the vena umbilicalis or of the ligamentum suspensorium hepatis and the subumbilical region, which extends along the arteria umbilicalis and the space adjoining the urachus. These two areas are entirely separate, and yet, for causes which will be mentioned later, inflammation in one may easily involve the other.

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[1] British Medical Journal, April 6, 1892; the cases of Langton (St. Bartholomew's Hospital Reports, Vol. XVII, p. 88), Nash (British Medical Journal, April 3, 1893), Cohen (Deutsche Zeitschrift für Chirurgie, 1890, p. 101), Owen (Lancet, November 18, 1893, p. 1247), and Johnson (ANNALS OF SURGERY, March, 1893).

[2] H. Fischer (Berlin): Die Eiterungen im subumbilicalen Raume. Sammlung klinischer Vorträge, No. 89.

The anatomy and pathology of the subumbilical space was first made the subject of investigation by Jouon in 1877. By him it was described as a triangle, having as its base a line drawn transversely through the navel, ending laterally at the outer edges of the rectus abdominis muscles, and its apex at a point about ten centimetres below the navel. The right and left parts of this space were described as equal in size, and so separate that each must be filled separately in order to demonstrate the cavity. This paper of Jouon's attracted but little attention, and almost no discussion. Charpy, however, in 1888, made a careful study of the ventral abdominal wall, and came to the conclusion that the subumbilical space was partly preperitoneal and partly prefascial.

The recent investigations of H. Fischer have given much more precise knowledge of the subumbilical space. His method of demonstration was as follows: An incision was made at the lateral edge of the rectus muscle, the point of a syringe was inserted between the sheath of the rectus and the peritoneum, and through this colored gelatin was slowly injected. As a result of this procedure, a tumor, shaped like the ace of spades, was produced, with its base at the navel and its apex 6 centimetres below the navel in the middle line. The lateral portions were most protuberant. Towards the mid-abdominal line the tumor decreased in prominence, and along the linea alba there was a deep groove. The measurements of the tumor were as follows: greatest breadth at the base, 14.6 centimetres; least breadth at the apex, 1.6 centimetres; greatest length, 9 centimetres. The space was present and approximately of the same size and shape in young and old, male and female, fat or thin persons. The navel itself and the firm adhesions which exist between the peritoneum and the sheath of the rectus shut off its cephalic border, and similar adhesions circumscribed its lateral limits. Jouon did not demonstrate a well-marked lower border, and thought that communication with the cavum Retzii existed unless closed by inflammatory adhesions. To this Fischer does not agree, as the gelatin injections in no case penetrated the space of Retzius. The space thus filled with gelatin was found to lie between the peritoneum and the fascia transversa Cooperi. This fascia is the thin fibrous layer overlying the inner surface of the musculus transversa and continued upon the diaphragm; above the navel its structure is so delicate as scarcely to merit the name of fascia, is markedly thickened below the navel, especially in the neighborhood of Poupart's ligament. The parietal layer of the peritoneum is firmly united to the fascia transversa along the linea alba and immediately around the navel, while on the sides of the abdomen the two are easily separated. On the inner surface of the navel the fascia transversalis is entirely absent. A cord-like mass of connective tissue accompanies the urachus and the umbilical artery. This has been named fascia subumbilicalis (Velpeau), or fascia infraumbilicalis (Heurtaux). It extends from the summit of the bladder to the navel, and its greatest development is reached in the neighborhood of the ligamentum suspensorium vesicæ. It diminishes markedly in size towards the navel.

The investigations of W. Herzog, as to the origin and limits of the subumbilical space, show that at the sixteenth week of fœtal life the umbilical artery is surrounded by an unusually well-developed adventitia, which surrounds the artery with a thick mantle of loose embryonal connective tissue. This mantle accompanies the artery deep into the abdominal cavity, beneath the bladder, and is doubtless a continuation of the tissues forming the umbilical cord. As fœtal development advances, this structure becomes changed to true connective tissue. During the first months after birth a cross section through the lower segment of the navel shows the entire space between the recti muscles filled with a mass of connective tissue, connected with the navel above, and at the sides continuous with the sheath of the rectus. A mesal section through this region in older children demonstrates the presence of a broad band of connective tissue extending from below towards the umbilicus and connected with the skin throughout its entire length by a series of radiating fibres.

Luschka has demonstrated that the urachus retains its tubular structure in the portion nearest the bladder, and at intervals along its caudal half. The lumen of its cephalic half, however, ultimately becomes obliterated. He was able to show also that the bladder musculature is continued along the vesico-umbilical ligament for a short distance only, and that from this point on connective tissue with elastic fibres surrounds the urachus like a sheath. A small valve-like opening on the inner surface of the bladder can usually be found through which a sound can be passed into the urachus for a longer or a shorter distance. The course of the urachus is somewhat tortuous, and here and there along its course are lateral dilatations which in some cases become cystic. The urachus may remain patent along its entire length. In fourteen such cases; which have been reported, twelve were males, for the male urethra, owing to its greater length and curved course, offers greater resistance to the escape of urine; the urachus in the male is, therefore, more apt to have urine forced into it. Finally, the investigations of Luschka show that a thin cord of connective tissue extends from the urachus to the ligamentum teres, thus forming a bridge connecting the supra- and subumbilical spaces, and furnishing a means for the extension of inflammatory processes.

Acute inflammations which occur in the subumbilical space have either an acute or a chronic course. They may originate in this locality or may occur from extension of the inflammatory process from some neighboring locality.

(1) *Acute Abscess of the Subumbilical Space.*—Acute abscesses of the abdominal wall have been described by many early writers, but, as a rule, so vaguely that the origin of the trouble has been a matter of doubt. In 1877, Heurtaux reported six cases of subumbilical abscess; of these, but one occurred in a previously healthy individual, the others developed after attacks of pleurisy, typhoid, measles complicated by pneumonia, and one during the puerperium.

The acute cases began with pain, fever, and constipation, rarely with vomiting. In subacute cases the general symptoms were very slight. The tumor that developed was immovable and triangular in shape; the base at the navel, the apex about midway between the navel and the symphysis. It contained a moderate amount of pus (120 to 150 grammes), and in four cases discharged its contents spontaneously,—twice through the navel, once in the middle of the hypogastric region, and once into the vagina; twice the abscess was incised. The abscess cavity in all of these was flattened antero-posteriorly. The subject has received little attention in France and still less in Germany.

The author reports five well-marked cases, similar to those of Heurtaux, and in each case the symptoms were quite characteristic. The patients were males, between seventeen and thirty-four years old; several had suffered from gonorrhœa, but with this exception all had previously been quite well. In no case could a history of injury be elicited. A marked chill ushered in the attack in each case, and the temperature varied from 38.5° C. (101° F.) and 39.5° C. (103° F.) throughout the disease. Change in position, sitting up in bed, or pressure upon the abdomen caused severe pain, radiating from the navel over the entire abdomen. The patients lay upon the back, the legs were drawn up, the abdomen was tense, the breathing of a purely costal type. Vomiting was frequent; the vomitus was at first slimy, and later stained with bile; food or drink increased the vomiting; it was preceded by nausea, and was followed by faintness; it was copious, and not in mere mouthfuls as is the case in peritonitis. The patients were pale and in a state of partial collapse; the extremities, however, remained warm. The pulse was frequent and small. Much thirst and anxiety disturbed the sufferers. These symptoms were often so pronounced that in many cases the attending physician feared the presence of a general peritonitis, and gave a very grave prognosis. Since abdominal pressure was so very painful to the patient, neither gas nor fæces were passed, and this rendered the diagnosis of ileus not infrequent. In Fischer's cases no bladder symptoms occurred, but Bouilly reports retention of urine in a similar case. The skin over the abdomen showed no redness at first, but in the course of three days a slight color showed below the navel. Palpation was unsatisfactory, owing to abdominal tension, and extreme pain on pressure.

These alarming symptoms continued for from two to four days, and then vomiting and collapse ceased, the bowels began to move, and the pain became localized about the umbilicus. Here, too, appeared slight redness on pressure, and a marked œdema. Careful palpation sometimes showed a firm area of infiltration, triangular in shape, and limited by the lateral recti boundaries. The skin was movable over this area, but was not raised in folds. Examined under an anæsthetic the recti were movable over the tumor. Percussion showed dulness over the entire region. By grasping the infiltrated area by the hand it could be lifted up with the abdominal wall. In the course of from nine to twelve days an elliptical tumor of the size and shape of the bladder developed immediately below the navel. Not infrequently a well-marked groove corresponding to the linea alba could be observed. The tumor in some cases became raised five or six centimetres above the level of the abdomen; its prominence decreased with the degree of abdominal pressure. Fluctuation became more and more evident.

Spontaneous rupture has been observed (*vide supra*), but Fischer's cases were operated upon early in the second week. In these latter cases (Fischer's) a quantity of thick yellow pus was evacuated, containing no gas, and without a fæcal odor. No actinomyces were found in the pus, but in two cases many large pavement epithelial cells were found; these were granular, and showed a distinct nucleus, usually kidney-shaped, but occasionally completely divided. The peritoneal cavity seems in all cases to have been protected by the thickened abscess-wall. The septum formed by the linea alba and its firm union with the peritoneum was usually either so pervious that even if the inflammation was one-sided at the beginning both halves of the subumbilical space were involved, or else the median septum was deflected by the pressure.

*Diagnosis.*—The correct diagnosis of existing conditions is somewhat difficult. Besides the symptoms of general peritonitis already mentioned, and the other symptoms that point to ileus, the possibility of appendicitis must always be considered and excluded. Ulceration of the stomach or of the intestines must also be taken into account in making a differential diagnosis.

A satisfactory explanation of the grave symptoms that mark the onset of the disease is difficult to find. They cannot be due to the pressure exerted by the transudate upon the peritoneum or to a diminution of the peritoneal cavity, for these conditions exist only at the beginning of the attack when the pressure is least. A circumscribed peritonitis might be held to be the cause of the initial symptoms were it not for the fact that this remains circumscribed and shortly disappears, and that, moreover, subperitoneal abscesses occur at other places without producing symptoms of peritonitis. It seems probable that the slow stretching and final rupture of the numerous connective-tissue fibres which unite the inner sheath of the recti muscles to the inscriptiones tendineæ is the source of the vomiting and severe pain manifest at the beginning of the attack. Experiments show that a slow and repeated stretching of these tissues produced by the insertion of a foreign body or by the injection of a fluid cause much more severe local and general symptoms than a sudden laceration due to a very large injection. In the formation of the abscess the painful distention and tearing of the tissues diminishes and the peritoneal symptoms cease.

*Prognosis.*—The prognosis in all cases so far observed is favorable. However severe and threatening the initial symptoms are, the subsequent course of the disease with skilful surgical treatment is mild and free from danger. After the opening and curetting of the abscess cavity, and the use of iodoform-gauze tampons, the cure is rapid, and is usually complete at the end of two or three weeks. The abscess cavity closes readily, and is unattended with the formation of fistulæ or of induration.

*Treatment.*—The treatment of the disease is expectant and symptomatic during the development of the abscess, but once the diagnosis of pus is clearly established the abscess cavity is to be opened and emptied of its contents. A careful use of the curette is usually advisable. The abscess cavity is then to be packed with iodoform gauze, and the routine treatment of similar cavities is to be carried out.

(2) *Chronic Abscess in the Subumbilical Space.*—A chronic abscess in this locality is even more of a rarity than is the acute form; the anatomical and clinical relations of the chronic process are, moreover, far from being clear. In the majority of the cases that have been reported, the abscess has been of tubercular origin; and the pus which finally escaped, after a long period of development, was pale in color, and contained numerous flocculi of cheesy material, such as are found in most tubercular inflammations. In a few cases actinomycosis abdominalis was the causative factor; the course of the disease is very slow, and is usually unattended with fever; in the pus which finally forms are to be seen the characteristic masses of the micro-organisms; these, of course, are rendered still more clear by appropriate staining and microscopic examination.

In these chronic cases the course of the disease is a long one, and after the abscess cavity has been emptied, fistulæ are prone to remain for some time; these are especially common at the umbilicus itself.

(3) *Rupture of Abscesses of Various Origin into the Subperitoneal Space.*—As the subperitoneal space is quite separate from the neighboring cavities, its involvement in purulent inflammations arising in other localities is not common. That it can be thus involved, however, is a fact to be borne in mind. Some of the cases in which this condition has occurred are of interest. An abscess of the liver, following the course of the ligamentum suspensorium hepatis to the navel, and thence along the connective-tissue bridge above described, has involved the space under discussion; when finally operated upon, five gall-stones the size of pigeon's eggs were found in the cavity, midway between the navel and the symphysis pubis. In another patient

a long-neglected empyema burrowed its way beneath the ventral insertion of the diaphragm, and finally caused the subumbilical space to be the site of a considerable accumulation of pus. An appendical abscess was the cause of this secondary involvement in a third case which has been reported.

Various complications may result in such cases. The treatment is, of course, directed towards the cure of the primary condition.

(4) *Tumors of the Subumbilical Space that have undergone Purulent Degeneration.*—These, too, are very rare. In one case an echinococcus cyst of the ventral abdominal wall was the condition found upon operation: this had broken down, and when the abscess wall was opened masses of pus were found, mingled with the parasitic growth. Until quite recently no case of dermoid cyst in this particular locality had been reported. Such a condition has recently occurred, and a mass of pus, cheesy material, and considerable hair was removed from the tumor mass. As epithelial cells are a normal constituent of the cavity-wall cancer can develop. Such a neoplasm was operated upon by Fischer, and a mass of pus allowed to escape. The patient who had suffered from the disease for many months, died fourteen days after the operation from inanition. The autopsy revealed a carcinoma composed of masses of large epithelial cells, such as were found in the normal subumbilical space. The tumor had broken down in many places, and contained much pus. Strangely enough, although the growth extended to the bladder, and was firmly adherent to that organ, the mucous membrane of the bladder showed no pathological changes.

Besides these primary carcinomata there are numerous ways in which secondary neoplastic deposits may occur in the subumbilical space, and by degenerative changes may discharge pus upon operation. The prognosis in such cases is well-nigh hopeless.

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